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COMPARISON OF WESTERN YELLOW PINE LOSSES ON FOUR SAMPLE CHECK AREAS; 1927-29

by

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Introduction

Many of our experimental studies and recommendations for control operations must be based on a knowledge of infestation cycles and the effect of factors which determine the trends. For this reason certain areas have been established which are typical for the east and west side yellow pine types. The four areas--Timber Mountain, Brown's Well, Buck Creek and Cascadel--have already been described by Person[1,2] in reports during 1928 and 1929. These areas are of two kinds: sample plots, in which intensive cruises are made annually by carefully examining each tree; and check areas, in which a more extensive cruise is made, using the 100 per cent strip method.

Timber Mountain and Brown's Well in western Modoc County, and Cascadel in the Sierra National Forest, are three areas of the sample plot type. The two western Modoc plots, representative of the east side yellow pine type, are 40 acres each, and Cascadel, representative of the west side type, is an 80-acre plot. Buck Creek of 320 acres, in the North Warner Mountains of northeastern Modoc County, and Cascadel of 640 acres in the Sierra National Forest near Northfork, Calif., are the two check areas. The Cascadel sample plot is a ten-chain strip running through the Cascadel check area.

Each year an inventory of the losses due to insects is taken to determine the trend of the general insect situation. The infestation on the Modoc sample plots, Brown's Well and Timber Mountain, and the Buck Creek check area, have all shown the same general trend between 1923 and 1929. Following the very dry year of 1924 and subsequent dry years until 1928, an infestation was built up which reached a peak in 1927, following which there was a very sharp decrease in 1928. Cascadel had its heaviest loss in 1925, with a gradual decrease in both 1926 and 1927 and a sharp one in 1928.

The cruising on all plots except Buck Creek has been done in the fall of each year; the Timber Mountain and Brown's Well plots were cruised in September of 1927, 1928 and 1929, and those on the Cascadel area during the latter part of October and early November of these years. Buck Creek was cruised for the first time in September 1928, at the time it was laid out. Subsequent cruises were made in June 1929 to check the 1928 winter loss, and on September 10, 1929. The winter losses checked in September are never complete because of later attacks and the difficulty of locating newly-attacked trees. It is the object of this report to assemble data showing losses over a period covering the past three years.

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[1] Person, Hubert L. Sample Plot Studies of Tree Selection by the Western Pine Beetle (D.brevicomis Lec.); ms. Jan. 15, 1929

[2] ---------- Cascadel and Buck Creek Check Areas. Summary of Surveys 1928; ms. May 3, 1929

Comparison of D.b. Losses on Timber Mountain, Brown's Well and Cascadel Sample Plots

The losses (Table 1 and Fig. 1) on the two Modoc plots of 40 acres each, Brown's Well and Timber Mountain, have shown a remarkable decrease in infestation since 1927. The loss during this year reached a peak, the infestation having been built up since 1924; 14 per cent of the total volume on Timber Mountain and 11.5 per cent on Brown's Well was lost during 1927. Cascadel, an 80-acre plot, on the other hand, showed a much smaller loss, only 1.5 per cent of the stand being killed during 1927; but even this is relatively high for the Cascadel site. The infestation for this site had reached a peak in 1925, when 2.5 per cent of the volume was killed.

The year 1928 showed a general decrease, compared with 1927, on both the Modoc areas, by far the greatest loss occurring during the summer. The loss on the Timber Mountain plot was considerably less than on the Brown's Well plot, but this was probably due for the most part to a control cutting which was established during thenfall of 1927 and winter of 1927-28, in which a selection system of cutting, based on Dunning's[3] tree classification was used. The Timber Mountain plot showed a loss of 1.8 per cent of the total volume in 1928, as compared with 5.4 per cent of the total volume on the Brown's Well plot. The summer losses for this year (1928) amounted to 1 per cent of the volume on Timber Mountain and 4.8 per cent on Brown's Well. The small winter loss, as pointed out by Person[4], is largely due to a marked increase in vigor of the stand during the 1928 growing season and to a general increase of predators, especially Enoclerus lecontei Wolc. The Cascadel plot showed no loss during 1928.

Aside from the much smaller total loss in 1928 than in 1927, it is noticeable that the trees killed in 1928 were of smaller average diameter (Fig. 1).

By 1929 the infestation on all three areas had reached a low ebb, which is characteristic of an endemic year. The volume loss was 0.9 per cent of the total on both Timber Mountain and Brown's Well plots, and 0.2 per cent on the Cascadel plot. This low loss was to be expected since the winter loss of 1928 was very slight, meaning of course that the beetle population to start the 1929 season had been materially reduced. The 1929 loss was much less than that of 1928, in spite of the fact that the increment was smaller (Fig. 3). It is to be noted, however, that the total winter loss of 1929 will not be known until a cruise is made next season. The following table sums up the D.b. losses on the three sample plots, both in volume and number of trees killed (see page 6).

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[3]Dunning, Duncan. A Tree Classification for the Selection Forests of the Sierra Nevada; vol.36,No.9,Jour.Agr.Res.,May 1,1928

[4]Person, H.L. Western Pine Beetle Biological Studies, Modoc Nat. Forest, Season of 1928; ms. June 1, 1929

Other Losses, 1927-1929

The timber loss from causes other than D. brevicomis are negligible when compared with the latter. For the three-year period considered the losses compared on the three sample plots are set forth in Table 2.

The loss attributed to man during 1929 on the Brown's Well plot was due to the cutting of trees for the railroad right of way of the Pickering Lumber Company. A total of 13 trees was cut, three of which were D.b. trees. All of the loss on the Cascadel plot occurred during 1927 with the exception of one tree with a volume of 50 board feet, which was killed by Buprestids during 1929.

Cascadel and Buck Creek Check Areas - D.b. Losses per Acre

These two areas were described and the losses shown in a summarized report by Person[2] in 1929. The total volume and tree loss by seasons, 1927-29, are shown in Table 3, and the volume loss on a per-acre basis for the past three years is shown graphically in Fig.2. The loss for 1927 was greater on both areas than for the two years following, especially during the summer; 300 board feet per acre was killed during the summer of 1927 on the Buck Creek area, as compared with 210 board feet per acre on the Cascadel area. Both summer and winter losses were decidedly smaller during 1928. The winter loss on the Buck Creek area, however, was greater than the summer loss by 33 board feet per acre. The total loss per acre on the Cascadel area amounted to 68 board feet per acre, 57 per cent of which occurred during the summer. The 1929 summer loss on Buck Creek was less than the 1928, and the winter loss up to September 1929 was but 1 board foot per acre. A complete record of winter loss, however, will not be known until another cruise is made. The Cascadel losses for summer and winter of 1929 showed about the same proportion as last year with a slight increase; a total of 77 board feet per acre was killed during 1929 compared with 68 board feet for 1928.

The 1929 cruise of the Cascadel area indicated an increased infestation, due to the large number of top-killed trees present. This condition is similar, though on a smaller scale, to the top-killing following the poor growing season of 1924. Nearly all the 1929 overwintering trees killed by D. brevicomis had been previously top-killed, and it is probable that many more of the top-killed trees will be killed by D. brevicomis.

Tree Selection on the Buck Creek Check Area

A comparison of the growth rates of 25 healthy trees of moderately fast growth rate and 11 trees killed by D.b. during 1929 showed a definite selection of the slower-growing trees (Fig. 3). The same general growth curve is shown for both groups, but a very wide variation in increment is evident; the average growth for the fast-growing trees is 1.063 mm. as compared with .326 mm. for the trees killed during 1929. Although the 25 living trees selected may be above the average in rate of growth, nevertheless the difference is so great that definite tree selection according to growth is shown in the choice of trees killed during 1929. This further supports the tree selection theory advanced by Person, which is now considered as definitely established.

The curve of growth (Fig. 3) shows a gradual falling off from 1924 to 1928, in which year the greatest increment since 1923 was put on. A falling off in growth again took place in 1929, this year showing the least growth of the eleven-year period. The insect loss during 1929, however, was less than for any year since 1923. This was due principally to the small beetle population on the areas at the beginning of the 1929 season, which in turn was the result of the vigor and consequent resistance of the trees, together with the abnormally large number of predators in 1928.

Infestation Studies on Buck Creek Check Area

While the figures in the foregoing tables give the trend of the total losses on the different areas, they do not show the relative abundance of any particular insect. Most of the trees are probably killed by D. brevicomis, but the abundance of this species varies independently of the total number of trees killed, because there is a difference in the percentage of bark area infested by the beetles from year to year. The proportion of primary insects infesting the bark area of trees may give us valuable leads in determining the relative importance of individual species, especially if studies can be made over a period of years on a given area. This type of investigation will also aid considerably in determining the trend of infestation for an individual species of insect.

During the first two weeks of June, 1929, a number of infested trees killed by winter broods of 1928 were felled and peeled. Careful observations were made on each tree from base to top, and the amount of each infestation recorded proportionately for the entire length. Using Keen's[5] Table 6 as a guide, the bark area in square feet was figured for each of 18 trees considered, and distributed according to the amount of infestation for each species of primary insect. These figures are tabulated in Table 4.

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[5]Keen, F.P. Administration of Western Pine Beetle Control Projects; Table 6, p. 33

The trees killed by the 1928 winter broods show definitely that D. brevicomis did the greatest amount of damage, 72 per cent of the bark area being infested by this species. Ips--of which the species emarginatus and oregoni are of greatest importance--ranked next, with 21.7 per cent of the bark area infested. D. monticolae infested 2.9 per cent and Buprestids 1.1 per cent of the bark area. 1.6 per cent was uninfested.

Table 1

Summary of D.b. Losses

Plot	1927				1928				1929			
	Summer		Winter		Summer		Winter		Summer		Winter	
	Volume	Trees	Volume	Trees	Volume	Trees	Volume	Trees	Volume	Trees	Volume	Trees
Timber Mt.	33,090	78	24,950	62	5,990	20	340	1	700	2	1,510	4
Brown's Well	50,750	60	14,790	18	28,990	42	3,410	4	2,150	4	3,470	2
Cascadel	11,240	17	4,430	3					380	1	1,790	2

Table 2

Summary of Other Losses - Total for Three Years

Sample Plot	Flatheads, Ips and D.monticolae		Windfalls		Man	
	Volume	Trees	Volume	Trees	Volume	Trees
Timber Mt.	2,120	10	160	1	100	1
Brown's Well	1,660	6			9,510	10
Cascadel	9,990	4				

Table 3

D.brevicomis Loss by Seasons on Cascadel and Buck Creek Check Areas

Check Area	Acres	1927				1928				1929			
		Summer		Winter		Summer		Winter		Summer		Winter	
		Volume	Trees	Volume	Trees	Volume	Trees	Volume	Trees	Volume	Trees	Volume	Trees
Buck Creek	320	99,320	92	67,930	63	15,870	14	26,770	23	13,630	10	570	1
Cascadel	640	134,280	117	49,810	47	25,470	44	19,070	24	27,570	23	21,880	26

Table 4

Buck Creek Check Area - Infested Bark in Square Feet

Tree No	D.brevicomis	D.monticolae	Ips	Buprestids	Total Infestation	Green	Total Area	Per cent Infestation
L--2	503.72		10.28		514.00		514.00	100
L--6	472.50	52.50			525.00		525.00	100
L--7	323.10	17.95		17.95	359.00		359.00	100
L--8	440.00		162.00		602.00		602.00	100
L-10	474.00				474.00		474.00	100
L-12	308.55	18.15	36.30		363.00		363.00	100
L-14	331.20		82.80		414.00		414.00	100
L-16	58.40		204.40	29.20	292.00		292.00	100
L-17	226.40	56.60	283.00		566.00		566.00	100
L-18	168.75	22.50	33.75		225.00		225.00	100
L-19	195.30	4.34	17.15		217.00		217.00	100
L-21	251.20	18.84	31.40	12.56	314.00		314.00	100
L-22	413.70		118.20		531.90	59.10	591.00	90
L-23	127.20	21.20	254.40	21.20	424.00		424.00	100
L-24	145.20		181.50		326.70	36.30	363.00	90
L-25	154.00				154.00		154.00	100
L-26	80.70		161.40		242.10	26.90	269.00	90
L-52	558.00				558.00		558.00	100
Totals	5,231.92	212.08	1,576.58	80.91	7,101.70	122.30	7,224.00	
Average	290.66	11.78	87.58	4.49	394.53	6.79	401.33	
% Aver.	72.0	2.9	21.7	1.1	98.2	1.6		

Fig. 1.

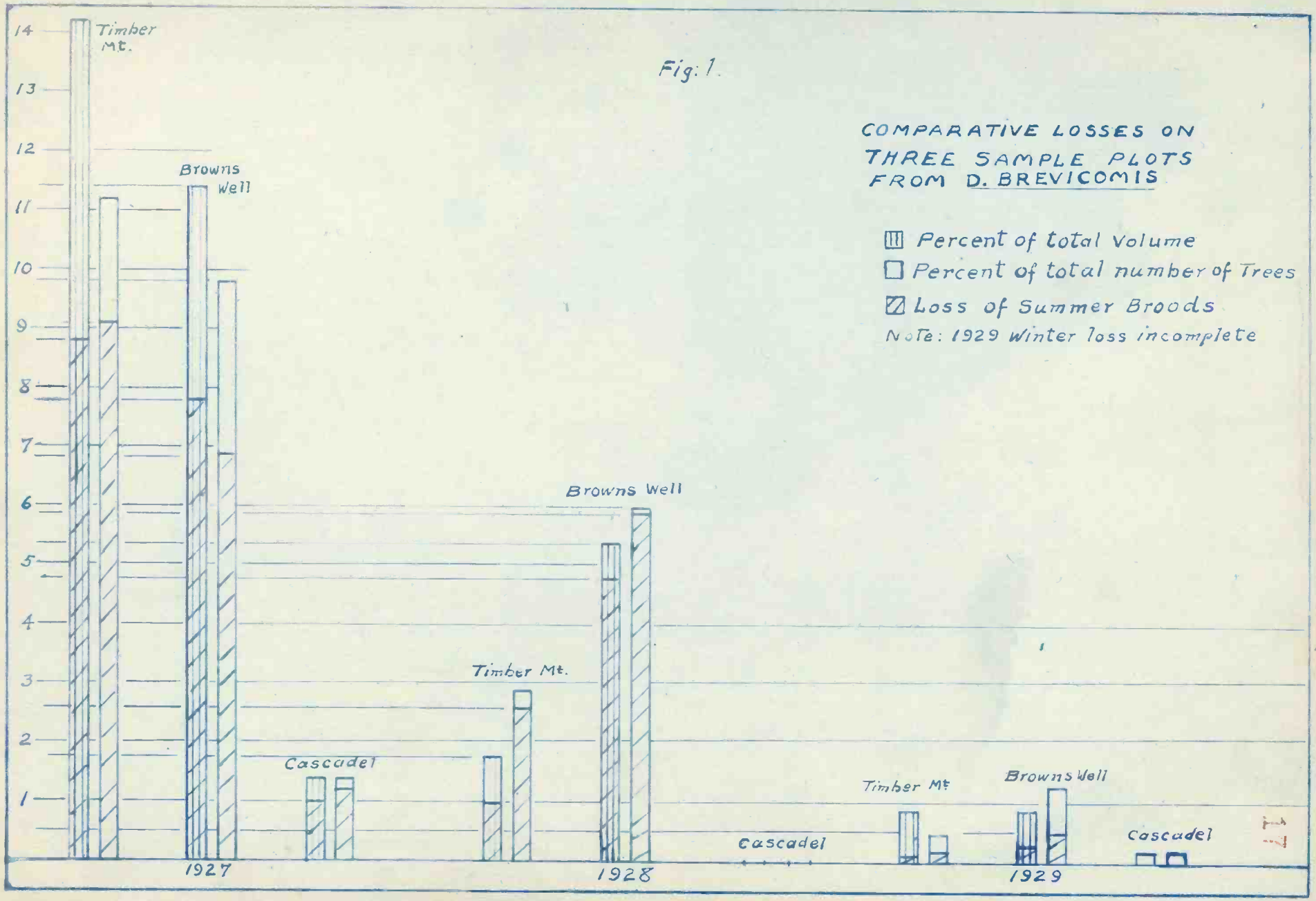

COMPARATIVE LOSSES ON
THREE SAMPLE PLOTS
FROM D. BREVICOMIS
Percent of total Volume
Percent of total number of Trees
Loss of Summer Broods
Note: 1929 Winter loss incomplete
14
13
12
11
10
9
8
7
6
5
4
3
2
1
Timber Mt.
Browns Well
Cascadel
Timber Mt.
Browns Well
Cascadel
Timber Mt
Browns Well
Cascadel
1927
1928
1929

Fig: 3

BUCK CREEK CHECK AREA
Comparative Growth Rates
(Average For 25) —— Selected Fast Growing Trees
(Average For 11) - - - 1929 D.B. Killed Trees
Losses For Last 3 Years Compared
As Percent of Total Volume Killed
(Note: 1929 Winter Loss Incomplete)

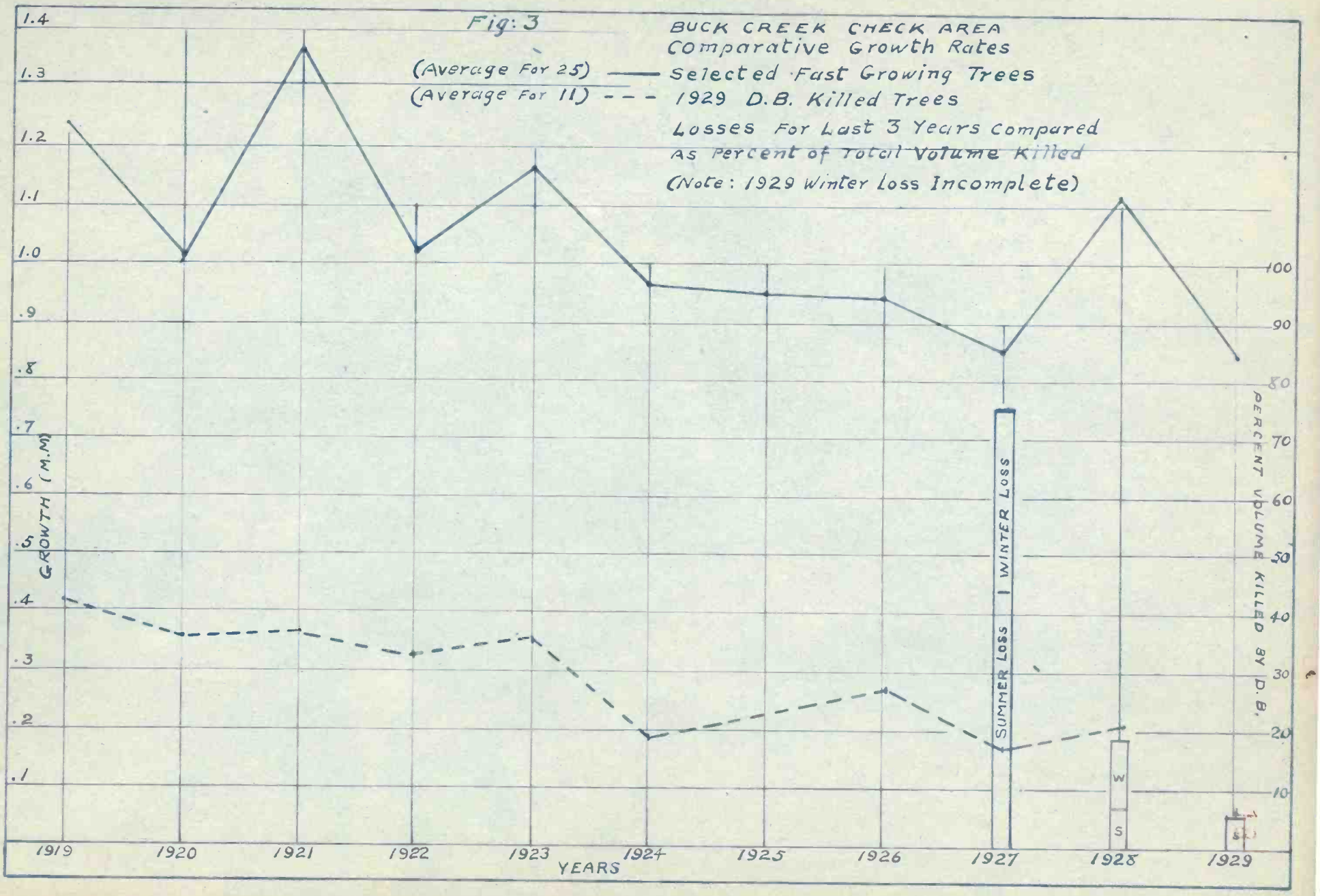
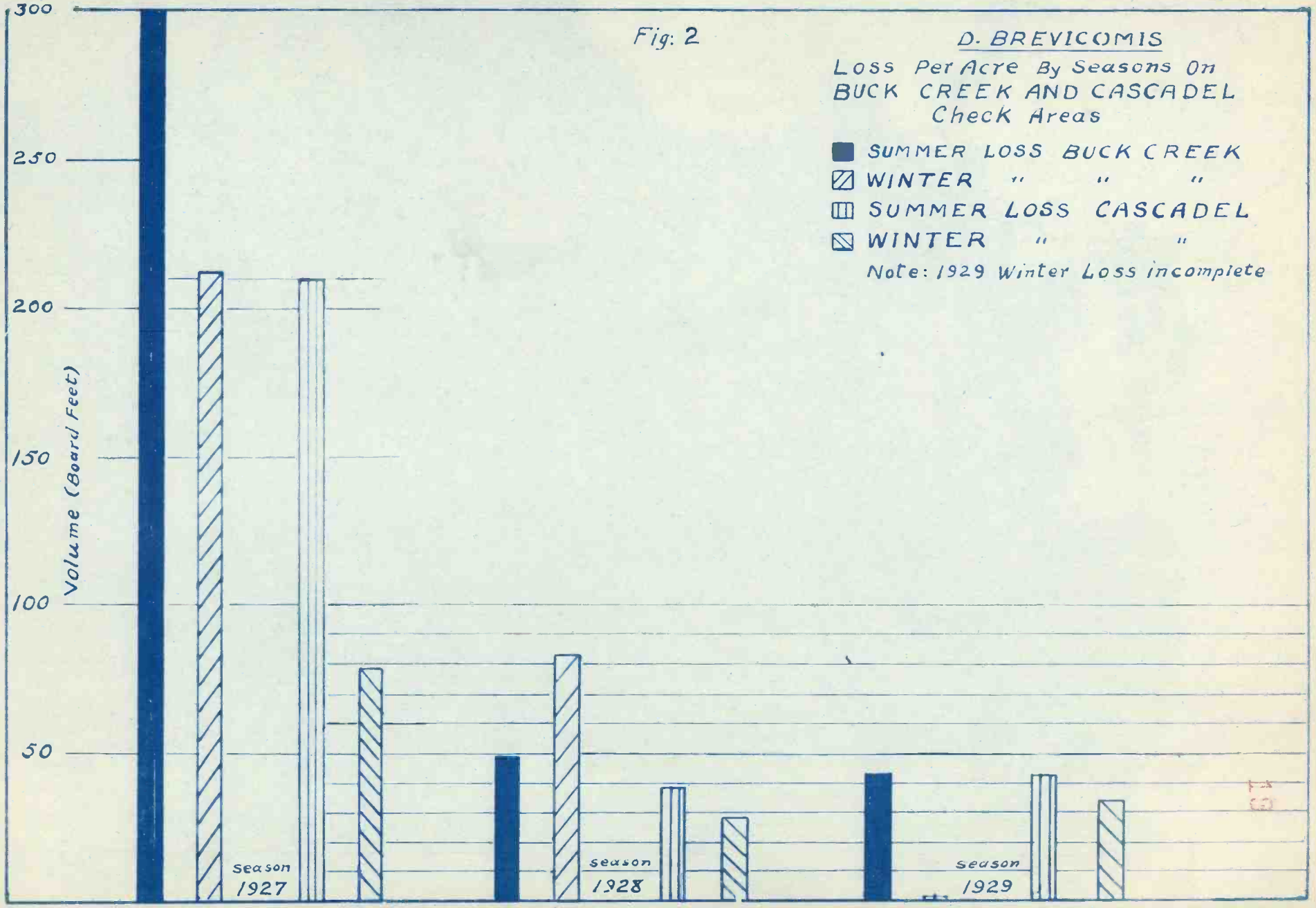


Fig. 2


D. BREVICOMIS
Loss Per Acre By Seasons On
BUCK CREEK AND CASCADEL
Check Areas
SUMMER LOSS BUCK CREEK
WINTER " " "
SUMMER LOSS CASCADEL
WINTER " "
Note: 1929 Winter Loss incomplete
300
250
200
150
100
50
Volume (Board Feet)
Season 1927
Season 1928
Season 1929